of pure metal intermixed with carburised metal, and also slag. The latter is said to play its part in rendering the total mass more coherent when heated and worked. This latter material when fused and cast into ingots is a totally different material, and behaves somewhat like steel. If this now comparatively homogeneous substance contain enough carbon (which sometimes is not the case; in the latter instance it is brittle and redshort, behaving somewhat like Bessemer blown metal) it works like a soft steel.

It follows, therefore, that if fusible compounds are present, and evenly diffused throughout the pure metal, their effect on steel is purely physical, and a heterogeneous metal like steel may be compared with rocks, which are known to be composed of siliceous particles, cemented or bound together by other compound bodies. Dr. Sorbys long ago noted this, and drew attention to the comparative uselessness of ordinary chemical elementary analysis, simply stating the percentage of elements present, and suggested that proximate analyses were equally required. The writer is fain to agree with him, his own experience of the comparative failure of ordinary analysis as a trustworthy guide in the manufacture having been somewhat extensive. The purest form of iron known to the writer is the Bessemer blown metal, beyond traces of carbon, with less than $\frac{1}{10}$th per cent. of sulphur and phosphorus. It is pure iron (with some kinds of iron only traces of these latter can be detected). This metal is worthless for commercial purposes, and this is said to be due to the presence of oxide of iron or possibly dissolved oxygen absorbed during the blow; to a certain extent this has been proved to be true. But the writer thinks that on the whole the pure material, even when freed from oxygen, would be commercially valueless, and if, shortly speaking, the cement theory or mixture of bodies (the one more fusible than the other), be true, pure iron is unworkable.

The opinions quoted are apparently not in accord with the theory of solution previously summarised, and leave unexplained the undoubted fact of the diffusion or solution of carbon in iron at low temperatures, tending, of course, if time be allowed, to the formation of a homogeneous material. Yet a carbide of iron is known, "Fe_4C," and has been isolated. It appears to the author that one somewhat reasonable explanation of this anomaly has been afforded by W. Mattieu Williams. He compares the union of carbon and iron to the processes of tinning or galvanising. If a plate of copper is immersed in melted tin a film of tin adheres to its surface, and if continued the tin will gradually soak into the copper, and in time will go through. Tin or zinc penetrates iron in the same way; mercury also amalgamates with copper; therefore carbon (Fe_4C) may be similarly distributed in iron.

This may or may not be the case, but in the author's opinion it does not meet all the difficulties, or afford a complete explanation of the phenomena taking place when iron is heated and worked in contact with carbon. Neither does the alternative theory of solution, either in the ordinary sense of the word or, better, as defined by modern physicists, afford a complete explanation. Yet on the whole the latter seems to afford a better and more complete all-round explanation of some curious changes observable when steel is heated up to certain varying temperatures, the results of which are now familiar to us.

Referring once again to the curious fact of the even distribution of carbon throughout iron, when plates of uneven composition as regards the percentage of carbon are heated together, it appears as the outcome of recent research[1] that chemical action, "or something closely approximating to it," takes place between solids, and even at low temperatures. Many experiments are given—thus dry ice and rock salt unite when placed in contact at a temperature decidedly below zero.

This is a very old experiment, but it is interesting as an example of the union of two solids below the fusing point of either, but above that of the product. He obtained similar results in other cases with sodium, potassium, calcium, and ammonium chloride, &c. This suggests the question, Are the metals combining to form an alloy "in the new way," *i.e.* in the form of solids, a freezing mixture?

Space does not admit of further quotation; the fact remains that solids combine with solids to form an alloy, or possibly what is termed a chemical combination.

At first sight this seems inconceivable and irrational. Many alternative theories and explanations of these curious phenomena are at our disposal. Yet there remains one simple way of accounting, at least in some degree, for this alloyage—or one ought perhaps to say the interpenetration of one element into another, as with carbon and iron. It is now, we think, generally admitted, in the light of recent researches on the vaporisation of the elements, "both in vacuo and at ordinary pressures," that no known element, however infusible, can be said to be *perfectly* stable at any temperature when freely exposed in space; and it is extremely probable that even such substances as iron and carbon are slowly dissociating at ordinary temperatures very much as water evaporates, and it follows that these are always enveloped in a thin atmosphere of their own vapour. The *quantity* of matter present in this form may never be recognisable; it may indeed be beyond the limit of our senses. Yet if such a process takes place, it affords a probable explanation of the diffusion of solids into each other. For admitting this it is evident that any mass or mixed masses of matter exist in an atmosphere formed by themselves. Such masses of matter cannot be discontinuous, strictly speaking, the sensible particles of which they are composed are not completely isolated from each other, and from this point of view the conception of the interpenetration of iron by carbon, or indeed other bodies, is, one thinks, rendered more easy.

John Parry.

NOTES.

Botanists all over the world will be sorry to hear of the death of the famous Swiss botanist, Alphonse de Candolle. He was in his eighty-seventh year. We hope to give on a future occasion some account of his services to science.

We regret to hear, through the *Botanical Gazette*, of the death of the Rev. T. Wolle, pastor of the Moravian Church, Bethlehem, Pennsylvania, an ardent student of freshwater algæ. Of his three most important publications, "Freshwater Algæ of the United States," "Desmids of the United States," and "Diatoms of the United States," at least the first two will always be standard works in the subject of which they treat.

The ordinary general meeting of the Institution of Mechanical Engineers will be held on Thursday evening and Friday evening, April 21 and 22, at 25, Great George Street, Westminster. The chair will be taken at half past seven p.m. on each evening by the president, Dr. William Anderson, F.R.S. The following papers will be read and discussed, as far as time permits:—Second report to the Alloys Research Committee, by Prof. W. C. Roberts-Austen, F.R.S. (Thursday, and discussion possibly continued on Friday); tensile tests and chemical analyses of copper plates from fire-boxes of locomotives on the Great Western Railway, by Mr. William Dean (in connection with the above report); Research Committee on marine-engine trials: abstracts of results of experiments on six steamers, and conclusions drawn therefrom in regard to the efficiency of marine boilers and engines, by Prof. T. Hudson Beare. The anniversary dinner will take place on Wednesday evening, April 19.

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[1] William Hollock, *American Journal of Science*, vol. xxxvii. 1889.

The Council of the Marine Biological Association of the United Kingdom have appointed Mr. Edward J. Bles director of the Laboratory at Plymouth. Mr. Bles has held an honorary research fellowship in zoology at the Owens College, Manchester.

The seventh annual photographic conference, organised by the Camera Club, was opened yesterday in the theatre of the Society of Arts, under the presidency of Captain Abney. Various papers were read, and others are to be read to-day. The annual exhibition of photographs by members will be on view at the club after conference week, and will remain open for about six weeks.

The thirteenth annual general meeting of the Essex Field Club will be held at Chelmsford on Saturday, April 15. It is proposed that before the meeting the members shall have a ramble in the neighbourhood of Chelmsford, and thus open the field meetings for the season. After the transaction of official business an address will be delivered by Dr. Laver, the retiring president, on "periodicity in organic life." His object will be to show that animals have periods of abundance and rarity, and that this is not due either to meteorological causes or to the agency of man.

The Council of the City and Guilds of London Institute, recognising the increasing importance in the mechanical reproduction of pictures, will, in the forthcoming examinations, to be held on May 3 and 13 next, give special importance to this branch, by dividing the examination in the Honours Grade into two classes, one for pure Photography, and the other for photo-mechanical Photography. Special examiners have been appointed for each branch, and candidates have the option of declaring in which branch it is their intention of entering. They will not, however, be allowed to compete in both branches. The certificates granted will show in which of the two divisions the candidate has passed. The Council of the Institute hope that the encouragement thus given to the photo-mechanical division will tend to form in this country a school of competent craftsmen in this branch of photographic work.

The twenty-fourth annual meeting of the Norfolk and Norwich Naturalists' Society was held recently at the Museum, Norwich, the president (Mr. H. B. Woodward) in the chair. Mr. T. Southwell was elected president for the ensuing year, and after the usual routine business the retiring president delivered the annual address. After giving some account of the work of the society during the session, he remarked that there was a slight increase in the number of members; also that the financial position was satisfactory. Turning attention to the geology of Norfolk, he expressed regret that the gaps left by the deaths of the older geologists were not filled by new-comers. Even collectors of fossils, who rendered such good service, were not nowadays so plentiful as formerly. Enthusiasm was damped by the difficulties in naming specimens, and these difficulties were increased by modern palæontological work. There were varieties of species which co-existed with the type; and there were variations which followed the type in chronological succession, and to the latter the name "mutations" had been given. He regarded the giving of specific names to these mutations as the most serious obstacle ever placed in the pathway of the student of nature. Allusion was made to the subject of geological "zones," and mention was made of the discovery of layers of phosphatic chalk in Buckinghamshire, and to their possible occurrence in Norfolk. Having referred to various other matters, Mr. Woodward expressed a hope that some day Norwich might have a university college, where prominence would be given to subjects of special practical importance in East Anglia.

Sir Thomas Gresham's Reader in Geometry at Gresham College being unable, owing to ill-health, to give the Easter course of lectures, the City Side of the Gresham Committee have permitted their delivery by deputy. The following course of lectures on special applications of the laws of chance is to be given:—April 18, "On Frequency Curves, their Nature, Variety, and Use," by Dr. John Venn, F.R.S.; April 19, "Chance in the Field of Biology," by Prof. W. F. R. Weldon, F.R.S.; April 20, "On some Points in the Philosophy of Chance," by the Rev. W. A. Whitworth; April 21, "Probability as the Guide of Astronomers," by Sir Robert S. Ball, F.R.S., Lowndean Professor of Astronomy in the University of Cambridge. The lectures are free to the public, and begin at six o'clock p.m.

Miss Caroline A. Foley contributes to the new number of *Mind* a vivid and very interesting account of the late Prof. Croom Robertson as a teacher. No one who reads it will have any difficulty in understanding the affection and respect with which his memory is cherished by his old pupils. Miss Foley, while regretting, as many others have done, that Prof. Robertson did not live to present "an integral view of his thoughts on any great questions of philosophy," suggests that some who heard him give expression to his ideas may have in their possession as much recorded material as would enable "any of his more competent contemporaries to synthesise and perpetuate what of it is chiefly and worthily distinctive." The editor of *Mind*, in a note, states that "this suggestion will probably be carried out."

A report of the first annual meeting of the Association of Head Masters of Higher Grade and Organised Science Classes has been issued. The meeting was held lately at Manchester, the chair being occupied by Mr. James Scotson, of the central higher grade school, Manchester. The report includes not only Mr. Scotson's address, but a vigorous paper by Dr. David Forsyth, head master of the central higher grade school, Leeds, on "higher education for the children of the people."

On April 8 several shocks of earthquake were felt over a wide area of south-eastern Europe. They were especially severe in western Servia. Shocks were also felt in Bulgaria and at various places in Hungary. They are said to have occurred in Hungary between 2 and 3 o'clock in the afternoon, in Servia at 2.55 p.m., at Sofia about 4 o'clock p.m. From Sofia the movement is reported to have been of an undulatory character and to have lasted about thirty seconds, the direction being from west to east. On Sunday and Monday fresh shocks were experienced in various parts of western Servia, but they were less severe than those of the previous day. According to a Reuter's telegram from Belgrade, the districts most seriously affected by the earthquake of Saturday are those of Morava and Pozarevac. Great damage was done in the towns of Svilajinac and Gradista, where the shocks followed one another in quick succession. At Livadica-Cuprija, as well as at Svilajinac, great fissures were opened in the earth, whence streams of water and quantities of yellowish matter were still issuing forth on Monday. Thousands of houses and a great number of churches are either in ruins or have become so severely cracked that the people are afraid to enter them. So great is the panic in the two districts named that not a single person ventures to sleep indoors.

Mr. W. R. Elliott, writing to us from Prince Ruperts, Dominica, W.I., on March 19, says that the northern end of the island of Dominica had for some time been the scene of what he calls "a most extraordinary display in the way of earthquakes." The house in which he was staying at the time is situated on a spur off the main ridge of the island, and, therefore, somewhat in the direct line of volcanic action in these islands. The shocks began on February 17, and were felt occasionally until March 18. They seem to have been most intense on March 12. Mr. Elliott says with regard to the shocks on that day:—"The shocks between 7.10 p.m. and 7.20 p.m. were very sharp, and followed one another rapidly. The sharp succession of shocks at 3.10 a.m. on the 13th inst. very much resembled this batch. The loud roar that accompanied each shock was very noticeable, and we could hear it distinctly immediately before each shock, in fact, could hear the earthquake coming along the hills to us. None of the shocks had that long undulatory motion that is usually felt when we have an earthquake that is felt throughout the islands, but the feeling was that we were being heaved up and twisted round, and the bumps seemed to give us a push northwards, and I could not help imagining that we were being pushed up to Guadaloupe. I mention this as showing how marked was the direction of the shocks. After 3.10 a.m. on the 13th the shocks became so frequent that I stopped noting them down, until after a short lull a sharp one was felt at 9.15 a.m."

THE weather has continued very fine over the British Islands during the past week, scarcely any rain having fallen in any part. With a very trifling exception in the south and east, the drought has continued since March 4, and in the south-east of England there has been no rain for upwards of three weeks. The temperature has been somewhat lower generally in the daytime, although in the inland and southern portions of the Kingdom the maxima during several days varied between 60° and 70°, but at the eastern coast stations the maximum temperature on several days did not exceed 45°, owing to the sun's rays being obscured by cloud and fog. During the latter part of the period the barometer fell slowly but uniformly; in the north of our islands the weather became less settled, and on Tuesday snow was falling in the Shetlands, still the general conditions indicated a probable continuance of dry weather, and an anticyclone in the north was spreading southwards. The *Weekly Weather Report* of the 8th instant showed that the percentage of bright sunshine for that period ranged from 38° to 60° in Scotland, from 53° to 66° in Ireland, and from 61° to 74° in England, while in the Channel Islands it was as high as 79°.

A SUMMER excursion to the Giant's Cause way for scientific study is being organised by Mr. C. Carus-Wilson. It is proposed that the party shall start for Portrush on July 1 or earlier, and return, if possible, through Dublin, so that they may have an opportunity of meeting the members of the Geologists Association, who are this year to visit the Wicklow Mountains.

WE have received a copy of a new prospectus of the electrical and general engineering college and school of science, Penywern House, of which Mr. G. W. de Tunzelmann is principal. It gives an account of recent extensions, and of others which are in progress.

IN the "Annals of Natural History" for the present month will be found an account of a very interesting zoological novelty. Mr. R. T. Günther describes and figures a remarkable new form of *Medusa*, or jelly-fish, that occurs in Lake Tanganyika. Until recent years, when the little *Limnocodium* was found living in the Victoria Lily-tank of the Botanic Gardens, Regent's Park, it was believed that the *Medusæ* were nearly exclusively oceanic. It is now shown that the freshwater lake Tanganyika is the home of a peculiar member of this group. The existence of such an organism in Tanganyika was asserted some years ago by the German naturalist, Dr. Boehm, and Prof. v. Martens, of Berlin, even went so far as to name it *Tanganjicæ*, although he had never seen a specimen. Mr. Günther now supplies us with a full description of this singular Hydrozoon, which he refers to a new genus, *Limnocnida*, adopting the suggestion of v. Martens as to its specific name. *Limnocnida tanganjicæ* is, as might have been anticipated, perfectly different from all the members of the group hitherto known, and probably represents a distinct family, but its exact position cannot be settled positively until the mode of its development has been ascertained.

A GOOD descriptive article on the prehistoric remains at Abury is contributed by Mr. A. L. Lewis to *Science* of March 24. The editor appends a note in which he says it has been thought that many Americans who, when in England, visit Stonehenge, may not be aware how many remains of a similar character, which they might also wish to inspect, exist in the British Isles. He has accordingly made arrangements for a series of short articles which shall give a description of each of the principal circles, and state what points should be noted and how it may be most easily visited.

MR. H. L. JONES records, in the *Botanical Gazette*, an example of a graft-hybrid between two different varieties of geranium, a red and a white. In several successive years the flowers partook of the characters of both parents; some were pure red, and others pure white; others had some of the petals white, others red; while in others again the petals were red mottled with white, or white mottled with red.

IF we may judge from the tone of an article on "conditions of forestry as a business," contributed by Dr. W. J. Beal to the New York *Engineering Magazine*, a good deal of anxiety is felt by some Americans about the extraordinary rapidity with which trees are vanishing from their country. Michigan had at one time a supply of standing pine which was believed to be well-nigh inexhaustible. Now it is found only in "small tracts in the back counties." The fathers and grandfathers of the present generation of Americans "cut down and burned the finest of the trees to make room for crops and pasture." "We have been taught," says Dr. Beal, "to destroy trees, not to save them—much less to replant." The growth of interest in forestry will, he thinks, be slow for some time yet, but he anticipates that popular feeling about the matter will be greatly changed, and that salutary laws will be passed, before the close of the present century.

MR. L. J. TREMAYNE notes, in the current number of the *Entomologist*, that he was walking down the Thames Embankment about two o'clock on March 8 (the sun being just at the time rather powerful), when a specimen of *Vanessa polychloros* alighted on the pavement about a couple of yards from him. The insect was, he thinks, perfect, and appeared very fresh. He tried to catch it, but it flew into the gardens on his left, and he saw no more of it. There was, however, no mistaking the specimen, which expanded its wings right in front of Mr. Tremayne. This occurred just above Waterloo Bridge.

AT the Technical Institute of St. Petersburg, M. Vladimiroff has deduced from experiment a set of rules for estimating the quality of vulcanised caoutchouc (*Rev. Sci.*). Recourse is had to physical properties, chemical analysis not giving any sure result. The following, in brief, are the conclusions:—(1) Caoutchouc should not give the least sign of cracking when bent to an angle of 180°, after 5 hours' exposure in an air-bath at 125° C. (the specimens 2·4 in. thick). (2) Caoutchouc having not more than half its weight of metallic oxides should bear stretching 5 times its length before rupture. (3) Caoutchouc exempt from all foreign matter except sulphur should be capable of stretching at least 7 times its length before rupture. (4) The extension measured just after rupture should not exceed 12 per cent. of the original length (with given dimensions). (5) Suppleness may be determined by calculating the percentage of ash after incineration. This may form the basis of choice for certain uses. (6) Vulcanised caoutchouc should not harden in cold. These rules are adopted for the Russian Navy.

The French Minister of War has recently had some experiments made on the resistance of ice. With a thickness of 4 centimetres (say 1·6 inches), it begins to bear the weight of a man marching alone; at 9 centimetres detachments of infantry in files may go on it; at 12 centimetres it will carry "pièces de 8" on carriages, and so on; till at 29 centimetres, it will bear the heaviest weights. M. Forel (*Rev. Sci.*) sees danger in this note; if an officer, trusting in the figures, ordered a troop on ice of measured thickness, he might, in some cases, be courting catastrophe. Those estimates, in fact, apply only to young ice, lamellar ice in process of freezing. When ice has for a few weeks been subject to alternations of temperature it changes in structure and loses much of its tenacity. The old ice of a pond, absolutely compact in appearance, is traversed by a multitude of vertical fissures dividing it into irregular prismatic needles, comparable in arrangement to columns of basalt, and from a half-centimetre to 1 or 2 centimetres in thickness. The structure becomes evident on breaking suddenly, in sunlight, a block of ice taken from a pond. Under these conditions old ice has not nearly such resistance as young ice.

The Michigan Mining School has published a "Catalogue," in which a full account is given of the various departments of its work. The institution was established and is supported by the State of Michigan "in accordance with that liberal educational policy which has placed the university of Michigan amongst the foremost educational institutions of America." It is stated with admirable directness that students at the school are supposed "to understand what they are there for, to attend strictly to that business, and to conduct themselves as gentlemen."

The new number of the *Internationales Archiv für Ethnographie* (Band vi., Heft i.) is occupied wholly with the concluding part of Dr. W. Svoboda's interesting notes (in German) on the inhabitants of the Nicobar Islands. The illustrations, as usual, are excellent.

The American Philosophical Society, Philadelphia, has issued a new instalment of its Proceedings (vol. xxx., no. 139). It opens with a paper on the mutual relations between the orbits of certain asteroids, by Daniel Kirkwood. There are also articles by Dr. D. G. Brinton on the Betoya dialects, and on the Etrusco-Libyan elements in the song of the Arval brethren; and by Prof. E. D. Cope on the phylogeny of the vertebrata (with two cuts), on some points in the kinetogenesis of the limbs of vertebrates, and on false elbow joints (with two plates).

A "Catalogue of Australian Mammals, with Introductory Notes on General Mammalogy," by J. D. Ogilby, has been published by order of the trustees of the Australian Museum, Sydney. Mr. E. P. Ramsay states in the preface that the work contains descriptions of all known mammals indigenous to Australia, with notes on allied fossil forms, compiled from various sources which are duly acknowledged by the author. Nearly all the species, Mr. Ramsay says, are represented by one or more specimens in the Museum.

The new number of *Records of the Australian Museum* (vol. ii. no. 4) contains the following papers:—On further traces of *Meiolania* in N. S. Wales, by R. Etheridge, jun.; notes on Australian Aquatic Hemiptera (No. 1) by Frederick A. A. Skuse; remarks on a new *Cyria* from New South Wales, by Frederick A. A. Skuse; geological and ethnological observations made in the valley of the Wollondilly River, at its junction with the Nattai River, Counties Camden and Westmoreland, by R. Etheridge, jun.

A volume on "Ironwork from the Earliest Times to the End of the Mediæval Period," by J. Starkie Gardner, has been issued as one of the South Kensington Museum art handbooks. It is mainly artistic, but the author has a good deal to say that is of scientific interest, and his scientific training enables him to present in an orderly way the historical facts with which he is chiefly occupied. Ironwork of later times will be dealt with in a second volume.

Some time ago Mr. C. E. de Rance prepared for the information of the County Councils a very useful map of the river basins in England and Wales, the object being to define the natural jurisdiction of joint committees of county councils for the prevention of pollution of rivers under section 14 (iii.) of the Local Government Act, 1888, and other matters requiring united control. The map has now been reprinted by J. E. Cornish, Manchester.

The Geological Survey of Canada is issuing a valuable series of "Contributions to Canadian Palæontology." The fourth part of the first volume, by J. F. Whiteaves, has just been published. It deals with the fossils of the Devonian rocks of the islands, shores, and immediate vicinity of Lakes Manitoba and Winnipegosis, and is well illustrated.

The York School Natural History, Literary, and Polytechnic Society has issued its fifty-ninth annual report. Much genuine interest in science is evidently maintained among the members of this society by the part they take in its work. The Natural History Club held in the course of the year twenty-three meetings, sixteen of which were occupied with the club's regular business of reporting and commenting on finds and observations.

The first part of an elaborate "Topographische Anatomie des Pferdes," by W. Ellenberger and H. Baum, has just been issued, the publisher being Paul Parey, Berlin.

A new sclerometer, constructed by M. Paul Jannetaz, was recently presented to the French Academy of Sciences. Like that invented by Seebeck, it measures the hardness of bodies defined as their resistance to scratching. It consists essentially of a platform rendered horizontal by means of leveling screws, and furnished with various motions which enable the observer to place any part of the body whose hardness is to be determined underneath a vertical point. This point is carried by an arm of a balance, which can be adjusted by a coarse and a fine movement, so as to bring the point and the body into contact without a shock. The beam is provided with pans carrying the weights which produce the pressure. At one extremity the beam carries a screw for horizontal adjustment, at the other a hollow bar to hold one of a set of points, such as copper or steel points of various angles, straight or curved, forming certain definite angles with the platform when mounted, or crystalline points clamped in metallic jaws. A very light aluminium beam is used for bodies which are only tested with light weights. As a rule the points trace a small circle on the body, which, when examined under the microscope, indicates the hardness of the substance in various directions. Homogeneous bodies like metals need only be moved in one direction. The scratch is viewed by reflection, greater softness being indicated by greater breadth. An interesting fact concerning the relative hardness of copper and zinc has been brought to light by means of this apparatus. Most authors regard zinc as harder than copper. If, however, the metals are examined in a sufficiently pure state, it appears that copper is the harder of the two. This removes an exception to the rule that the harder the body the less its atomic volume.

In a paper communicated to the Royal Prussian Academy of Sciences (see also *Electrician*, vol. xxx. p. 660) Dr. Philipp Lenard gives an account of some interesting experiments on the rays given out by the kathode of a Geissler tube which produce phosphorescence. Thin metal plates being to a great extent transparent to these rays by closing a small hole in the observing tube by a plate of aluminium 0·003 mm. thick, it was possible to study their properties outside the tube. It was found that the rays produce a slight luminosity in air, and when they fall on phosphorescent bodies, held near the window, cause the latter to shine with the same light they show when enclosed within the vacuum tube itself. The brightness diminishes rapidly as the distance from the window increases, so that in air all glow ceases at about 6 cm. On bringing a magnet near the tube so that the kathode rays no longer fall on the inner surface of the window, all phosphorescence ceases without the tube. A quartz plate half a millimetre thick entirely stopped the rays ; ordinary gold, copper, and aluminium leaf, however, allowed them to pass almost undiminished. In air at the ordinary pressure these rays are not propagated in straight lines but are diffused, so that it is impossible to obtain a sharp shadow of a body placed between the window and the phosphorescent substance. As these waves cannot be generated in a high vacuum it has been up to now impossible to say whether they are only propagated when matter is present. By enclosing the observing tube in another, the author has shown that in the best vacuum attainable with a mercury pump, these waves are transmitted with as great facility as in air at the pressures ordinarily existing within Geissler tubes. Different gases transmit the rays to very different extents, thus, with hydrogen at atmospheric pressure, phosphorescence is produced in a body placed at a distance of 20 cm. from the window. These experiments seem to show that while for light of the smallest known wave-length the matter behaves as if it completely filled the space it appears to occupy, in the case of these kathode rays even gases behave as non-homogeneous media, and each separate molecule acts as an obstacle diffusing the rays.

NOTES from the Marine Biological Station, Plymouth :— Recent captures include the Polyclada *Eurylepta cornuta*, *Cycloporus papillosus* and *Leptoplana*, the Actinian *Zoanthus Couchii*, and the Opisthobranchs *Scaphander lignarius* and *Ægirus punctilucens*. The sea has lately become increasingly richer in diatoms and floating algæ, esp. *Coscinodiscus*, *Rhizoselenia* and the so-called "gelatinous alga." In the floating fauna the Dinoflagellate *Ceratium tripos* has been constantly plentiful throughout the winter ; *Noctiluca* is very scarce. Of the Hydroid medusæ, small *Obeliæ* are still abundant ; medusæ of *Clytia Johnstoni* are generally present ; and Forbes's *Thaumantias octona* has been again observed. The Actinian larva *Arachnactis* occurs in most townettings. Zoææ of *Porcellana* have slightly increased in number. The Actinian *Bunodes verrucosa* (= *gemmacea*) is now breeding.

THE additions to the Zoological Society's Gardens during the past week include a Leopard (*Felis pardus*) from India, presented by Admiral W. B. Kennedy, R.N., F.Z.S. ; a Common Squirrel (*Sciurus vulgaris*) British, presented by Miss Edith Mackenzie ; two Black Rats (*Mus rattus*) British, presented by Mr. Sydney Wedlock ; a Panama Amazon (*Chrysotis panamensis*) from Panama, presented by Mrs. Mackey ; a European Pond Tortoise (*Emys europæa*) European, presented by Mast. J. F. Harben ; a Macaque Monkey (*Macacus cynomolgus*) from India, deposited ; a Common Pintail (*Dafila acuta*) European, a Bell's Cinixys (*Cinixys belliana*), a Home's Cinixys (*Cinixys homeana*) from West Africa, purchased ; a Mute Swan (*Cygnus olor*) European, received in exchange ; three Coypus (*Myopotamus coypus*) born in the Gardens.

OUR ASTRONOMICAL COLUMN.

SOLAR OBSERVATIONS AT ROME.—In the *Memorie degli Spettroscopisti Italiani* for March, Prof Tacchini communicates the solar observations made at the Royal College. These observations refer to the 4th trimestre of 1892, and are given here somewhat in detail. Taking prominences first, the numbers show a great falling off when compared with the preceding three months ; thus for the northern and southern hemispheres the frequency of these phenomena for the three months was 81, 78, 61 for the former (sum 220) and 105, 138, 90, for the latter (sum 333) the foregoing trimestre giving 431 and 493 for each hemisphere. The greatest frequencies took place in latitudes + 60° + 70° N. and − 30° − 40° S., but the numbers indicate really two other maxima for each hemisphere, and they lie in the zones + 30° + 20° and − 50° − 60°.

The frequency of groups of faculæ recorded for both north and south latitudes are given as 100 and 132 respectively ; the average for each month amounted to 37, but for the southern zones during October an increase to 20 above this average was noted ; the greatest frequencies occurred in zones + 10° + 20° and − 20° − 30°. In dealing with the spots their frequency may be generally stated to be about half that of the faculæ. The table gives 46 and 58 for the two zones, and in this case also the greatest disturbances seem to have occurred in the southern hemisphere during October ; the numbers for the monthly records are, for the northern zones 18, 13 and 15, and for the southern 26, 12, and 20, the greatest frequencies occurring in latitudes + 10° + 20° N. and − 20° − 30° S.

Prof. Tacchini, in addition to the above communication, describes in a short note a large protuberance observed on November 20 of last year, and gives 10 figures to illustrate the various forms which it successively assumed. The height and velocity of ascent can be gathered from the few numbers below :—

″		H.	M.
146·3	about	10	57
155·5	,,	11	22·5
188·8	,,	1	21
184·1	,,	1	58
186·4	,,	2	38
154·6	,,	2	52

PARALLAXES OF μ AND θ CASSIOPEIÆ.—In No. 5 of the contributions from the Observatory of Columbia College, New York, Mr. Harold Jacoby presents us with the results he has obtained with regard to the parallaxes of μ and θ Cassiopeiæ, as deduced by him from an examination of the Rutherfurd photographic measures of the stars surrounding μ Cassiopeiæ. The negatives, which were twenty-eight in number, two impressions being on each plate, were made between July, 1870, and December, 1873, and as they were specially taken for parallax determinations, the observations were restricted to the months of July, January, and December. The study of the parallax here made is based upon measures of distance only. Each pair of stars was selected so as to differ approximately 180° in position angle with respect to μ Cassiopeiæ, and the scale value was determined for each pair, on each plate, in order to make the sum of the distances from μ constant. By taking the difference of the same distances as the quantity from the variation of which the parallax should appear, "the excess of the parallax of the principal star over the mean of the parallaxes of the two comparison stars" is, satisfying certain conditions, finally obtained.

The values for the parallaxes which he has obtained are—

Parallax of μ Cassiopeiæ ... 0″·275 ± 0″·024
,, ,, θ ,, ... 0·232 ± 0·067

On comparing the former of these values with the work of other observatories the discordances, he says, are large. The Oxford photographic result was 0″·036 ± 0″·018, while the Rutherfurd plates gave 0″·249 ± 0″·045, the same pair of comparison stars being used in each case. Struve from distant measures deduced the value 0″·251 ± 0″ 075, and from position angles the value 0″·425 ± 0″·072. "It is therefore plain that the photographic method of determining parallaxes cannot be regarded as free from systematic error."

FALL OF A METEORITE.—A brief account of the fall of a meteorite at a place in South Dakota, 4 km. south of Bath, on August 29 of last year, is given in the current number of *Prometheus*, No. 183. It was observed about four o'clock in the afternoon, attention being first drawn to it by the sound of a series of explosions. As the observer looked upwards he saw a meteoritic stone flying through the air, leaving a trail of smoke behind it. On reaching the ground it plunged to a depth